

# PATENT COOPERATION TREATY

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## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 28 MAY 2004 WIPO PCT
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Applicant's or agent's file reference <b>PCT2120</b>	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. <b>PCT/US03/18522</b>	International filing date (day/month/year) <b>11 June 2003 (11.06.2003)</b>	Priority date (day/month/year) <b>11 June 2002 (11.06.2002)</b>
International Patent Classification (IPC) or national classification and IPC <b>IPC(7): G01V 3/00 and US Cl.: 324/348</b>		
Applicant <b>THE REGENTS OF THE UNIVERSITY OF CALIFORNIA</b>		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of report with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand <b>31 December 2003 (31.12.2003)</b>	Date of completion of this report <b>04 May 2004 (04.05.2004)</b>
Name and mailing address of the IPEA/US Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703) 305-3230	Authorized officer <b>Jay M. Patidar</b> Telephone No. (571) 272-2800

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International Application No.

PCT/US03/18522

**I. Basis of the report****1. With regard to the elements of the international application:\***

- ☐ the international application as originally filed.
- ☒ the description:  
pages 1-13 as originally filed  
pages NONE, filed with the demand  
pages NONE, filed with the letter of \_\_\_\_\_.
- ☒ the claims:  
pages NONE, as originally filed  
pages NONE, as amended (together with any statement) under Article 19  
pages 14-17, filed with the demand  
pages NONE, filed with the letter of \_\_\_\_\_.
- ☒ the drawings:  
pages 1-4, as originally filed  
pages NONE, filed with the demand  
pages NONE, filed with the letter of \_\_\_\_\_.
- ☐ the sequence listing part of the description:  
pages NONE, as originally filed  
pages NONE, filed with the demand  
pages NONE, filed with the letter of \_\_\_\_\_.

**2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.**

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

**3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:**

- ☐ contained in the international application in printed form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

**4. ☒ The amendments have resulted in the cancellation of:**

- ☒ the description, pages NONE
- ☒ the claims, Nos. NONE
- ☒ the drawings, sheets/fig NONE

**5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\***

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

**V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. STATEMENT**

Novelty (N)

Claims 1-20 YES  
Claims NONE NO

Inventive Step (IS)

Claims 1-20 YES  
Claims NONE NO

Industrial Applicability (IA)

Claims 1-20 YES  
Claims NONE NO**2. CITATIONS AND EXPLANATIONS**

Claims 1-20 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest a system or a method for modeling seafloor conductivity with a plurality of units deployed at different locations on the seafloor; each unit comprising an assembly, including a frame for supporting a plurality of electrodes, the assembly configured for resting on the seafloor; a pair of electrodes, mounted in relation to the frame in vertical displacement from one another, to form a dipole, wherein each electrode of the dipole is in electrical communication with an output providing a signal that is induced by vertical electric fields present near the seafloor.

Claims 1-20 meet the criteria set out in PCT Article 33(4), and thus meet industrial applicability because the subject matter claimed can be made or used in industry.

NEW CITATIONS

NONE

What is claimed is:

1. A system for modeling seafloor conductivity, the system comprising a plurality of units deployed at different locations on the seafloor, each unit comprising:
  - 5 an assembly, including a frame for supporting a plurality of electrodes, the assembly configured for resting on the seafloor;  
a pair of electrodes, mounted in relation to the frame in vertical displacement from one another, to form a dipole, wherein each electrode of the dipole is in electrical communication with an output providing a signal that is  
10 induced by vertical electric fields present near the seafloor.
2. The system of claim 1, wherein a lower electrode of the pair of electrodes is mounted so that it is positioned above the frame.
- 15 3. The system of claim 1, wherein the pair of electrodes are disposed on a substantially rigid arm attached to the frame.
4. The system of claim 3, wherein the arm has a length in the range of 1 to 2 meters.
- 20 5. The system of claim 1, further comprising a second pair of electrodes, mounted in relation to the frame in vertical displacement from one another, to form a second dipole, wherein each electrode of the second dipole is in electrical communication with a second output providing a signal that is  
25 induced by vertical electric fields present near the seafloor.
6. The system of claim 5, further comprising a cable coupled to the frame, wherein the second dipole is mounted to the cable and the displacement between the electrodes in the second pair is substantially greater than the  
30 displacement between the electrodes in the first pair.
7. The system of claim 1, wherein the electrodes are mounted on a cable attached to the frame and further comprising a float disposed at a distal  
35 end of the cable.

8. The system of claim 1 further comprising:  
at least two magnetic field induction sensors disposed horizontally on the frame orthogonal relative to each other.

- 5 9. A system for modeling electrical conductivity of the seafloor, the system comprising a plurality of units deployed on the seafloor, each unit comprising:
- a frame adapted for deployment to the seafloor;
  - a pair of horizontal dipoles extending from the frame in an orthogonal orientation relative to each other for generating a pair of first electric field signals;
  - 10 a pair of vertically-displaced electrodes extending vertically from the frame and vertically displaced relative to each other to form a vertical dipole for generating a second electric field signal;
  - at least one first amplifier in electrical communication with the horizontal and vertical dipoles for amplifying each of the first and second electric field signals,
  - 15 the first amplifier having a low input impedance and high gain;
  - a data logging processor in electrical communication with each of the first amplifier for receiving amplified electric field signals and storing data representative thereof;
  - a clocking device for synchronizing operation of the data logging processor
  - 20 with other data logging processors on other units within the system;
  - a power supply in electrical communication with the data logging processor, the clocking device and the first and second amplifiers;
  - at least one housing for enclosing the data logging processor, the clocking device, the first amplifier and the power supply, the at least one housing adapted for
  - 25 corrosion and pressure resistance in seawater;
  - means for deploying the unit to the seafloor; and
  - means for retrieving the unit from the seafloor.

30 10. The system of claim 9, wherein a lower electrode of the pair of second electrodes is positioned at a height above the frame.

11. The system of claim 9, wherein the vertically-displaced electrodes are disposed on a substantially rigid arm attached to the frame.

12. The system of claim 11, wherein the substantially rigid arm has a length in the range of 1 to 2 meters.

13. The system of claim 11, further comprising:  
 5 a cable attached to and extending from the frame;  
 a float disposed at a distal end of the cable; and  
 a second vertical dipole comprising a second pair of vertically-displaced electrodes disposed on the cable for generating a third electric field signal, wherein the second vertical dipole is substantially longer than the first vertical  
 10 dipole, and wherein the second vertical dipole is in electrical communication with the at least one first amplifier.

14. The system of claim 9, wherein the vertically-displaced electrodes are disposed on a cable and further comprising a float disposed at a  
 15 distal end of the cable.

15. The system of claim 9 further comprising:  
 at least two magnetic field induction sensors disposed horizontally on the frame orthogonal relative to each other;  
 20 a second amplifier disposed within the at least one housing in electrical communication with the induction sensors for amplifying a magnetic field signal generated by each induction sensor; and  
 wherein the second amplifier is connected to the power supply and provides an amplified magnetic field signal to the data logging processor.  
 25

16. A method for modeling seafloor conductivity, comprising:  
 deploying a plurality of units at different locations in an area of interest on the seafloor, wherein each unit includes:  
 an assembly including a frame for supporting a plurality of  
 30 electrodes, the assembly configured for resting on the seafloor;  
 a pair of electrodes, mounted in relation to the frame in vertical displacement from one another, to form a first vertical dipole, wherein each electrode of the dipole is in electrical communication with an output providing a signal that is induced by vertical electric fields present near  
 35 the seafloor;

using the units to sense horizontal and vertical electric fields over a pre-selected spectrum;

collecting data corresponding to the sensed electric fields from each of the plurality of units; and

5 generating a model of resistivity using the collected data.

17. The method of claim 16, wherein each unit includes a second pair of electrodes, mounted on a cable attached to the frame, in vertical displacement from one another by an amount greater than the vertical  
10 displacement between the first pair of electrodes and forming a second vertical dipole.

18. The method of either claim 16 or 17, further comprising:  
towing an EM transmitter close to the seafloor within the area of  
15 interest;  
wherein the step of sensing comprises detecting electric fields generated by the EM transmitter.

19. The method of claim 16, wherein the assembly is further adapted  
20 for measurement of magnetic fields.

20. A method of exploring seafloor conductivity, comprising:  
using, at a plurality of locations, a plurality of vertically spaced electrodes,  
to provide a signal induced by vertically oriented fields at each location; and  
25 obtaining a measurement at each of the locations associated with the signal thereat.